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Scaffolding with Peer Tutoring in the Teacher's Perspective: Could Its Implementation in Learning Programs Improve Scientific Communication Skills and HOTS

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Abstract: This essay's purpose is to provide a summary the perceptions of science teachers towards scaffolding learning programs with peer tutoring in improving scientific communication skills and HOTS. This research was conducted in the province of Lampung, Indonesia, involving 74 middle school science teacher respondents. A mixed method with a sequential explanatory design was used for the study. Data were collected through interviews and surveys, and descriptive analysis was used to analyse the results. The survey findings indicate that science instructors have a favourable opinion of using scaffolding in conjunction with peer tutoring. The analysis's findings indicate that most instructors have not used peer tutoring and scaffolding in the classroom to help students advance from their current competencies to potential competencies. In addition, teachers also have not implemented scaffolding learning programs with peer tutoring.

Keywords: HOTS; Learning Program; Peer Tutoring; Scaffolding; Scientific Communication Skills.

Introduction

Globalization in the 21st century has tough challenges, especially in science education which requires the younger generation to increase their competence, which does not only focus on cognitive abilities but also on cognitive skills (Hamzah et al., 2022; Otero et al., 2022; Wahyudiati, 2022). Trends in learning activities that currently dominate future needs are scientific communication skills and HOTS. Two important skills that are needed in the current and future job market, these skills will really help someone in solving problems faced in their respective fields (Dewi & Fauziati, 2021; Hilliker et al., 2022; Maker, 2021; NACE, 2020). Based on this, it is appropriate that education in schools directs its attention to the development of scientific communication skills and HOTS (Ilmi et al., 2020; Wati et al., 2019).

The TIMMS and PISA evaluation competition surveys of Indonesian students who are still in the LOTS level show that the HOTS abilities of Indonesian students are still quite low (OECD, 2019a, 2019b). This indicates that students' scientific literacy is still low, both in terms of process, content, application of science which is still not in line with expectations, and there is still a lot of rote material (Summaries, 2019). In addition, the results of another survey related to the implementation of learning conducted by *KPAI (Komisi perlindungan Anak Indonesia)* only a small number of teachers have emphasized collaborative learning that trains scientific communication skills to students, the low level of these skills will have a negative impact on students' cognitive development (KPAI R.N, 2021). Undeveloped scientific communication skills will become an obstacle for students to express their ideas or ideas, so that students will have difficulty connecting learning concepts to solving a problem or learning task. (Yasir et al., 2020).

Based on these issues, the learning process itself, whose application still depends on conventional methods, has an impact on students' low scientific communication skills and HOTS in the scientific field. Experts admit that conventional learning is not very

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effective in improving cognitive skills such as scientific communication skills and HOTS because it does not provide good feedback in developing students' potential competencies to be actively involved in participating in learning activities. (Hamzah et al., 2022; Jufriadi et al., 2022; Wannapiroon & Pimdee, 2022). According to these issues, a teacher's ability to create learning programmes using the right learning strategies and to be able to guide students in using these two skills is a major determinant of the success of students' scientific communication skills and HOTS. One of the lessons that trains students to improve the skills of thinking, working, being scientific and communicating science well is scaffolding. (Farida et al., 2022; Greenstein, 2012; Senisum et al., 2022) So that students not only remember a set of facts but can also find learning concepts for themselves by asking questions, observing, submitting hypotheses, collecting data, processing and drawing conclusions from all forms of data. (Umar & Ko, 2022; Umardiyah & Laili, 2021). The practise of scaffolding learning is always founded on social interaction learning to develop ZPD (Zone of Proximal Development) through assistance from the teacher to comprehend learning concepts (Alharbi, 2022; Pitman et al., 2023). The relationship between ZPD and scaffolding can be seen when the teacher provides assistance to students who find it difficult to solve problems or learning tasks in their ZPD (Angrist et al., 2021; Donnelly & Patrinos, 2021; Engzell et al., 2021; Grewenig et al., 2021; Hammerstein et al., 2021; Kaffenberger, 2021; Storey & Zhang, 2021).

In addition to the assistance (scaffold) provided by the teacher, it would be better if other study partners/students could also provide a scaffold in solving problems or learning assignments. Therefore the use of peer tutoring can be used to support the learning process that focuses on providing scaffolds by their learning partners, so that there is a complex interaction between the teacher and students in helping develop student competencies to reach their potential competencies. Students who are highly competent (smart) are given the opportunity to instruct their study companions in order to increase interaction and facilitate problem-solving under the guidance of the teacher. This method of learning is known as peer tutoring (Manubey et al., 2021; Prihatinah & Utami, 2018; Sumarni, 2022). The establishment of learning interactions between the learning taps (tutor and tutee) more intensively and continuously can improve mastery of abstract learning concepts, facilitate students to think comprehensively, and make it easier for students to understand learning facts to be implemented or applied in everyday life -day.

Through the assistance (scaffold) provided by the teacher by combining the peer tutoring method provided by the learning tutor to support the learning process, a complex interaction will be formed between the teacher and the learning tutor in helping to develop students' competence in achieving their potential competencies. Based on these findings, this research seeks to describe how teachers and students view science instruction. As a result, it is essential to create a peer tutoring programme to scaffold learning and enhance students' scientific communication abilities.

Method

This research activity uses mixed methods by combining data (qualitative and quantitative) to evaluate learning programs (Xu & Meier, 2022). The research strategy used sequential explanatory design which was carried out sequentially with data collection techniques and qualitative and quantitative data analysis (Tachie & Kariyana, 2022). Research activities were carried out at public/private junior high schools in Lampung Province, Indonesia. The research subjects used were 74 science teacher respondents. To gather information, surveys using Google forms were distributed online through the MGMP IPA forum (Natural Science Subject Teacher Consultation). The purpose was to learn how science teachers perceived their role in providing scaffolding and peer tutoring for the learning programmes that were being used. The provided questionnaire asks about three things, including your HOTS and scientific communication abilities, scaffolding learning programs with peer tutoring. The teacher's requirements questionnaire was used as a tool during the preliminary study activity stage to gather data regarding the learning strategy employed and the outcomes of the analysis of the learning programme used by the teacher during learning activities.

The next stage is to analyze the results of the teacher needs questionnaire which is described in percentage form, then interpreted qualitatively. The percentage of responses for each item that was submitted was used to analyse the questionnaire's findings. The triangulation and integration of research design schemes, as seen in the following Figure 1, have the same priority as the emphasis on both studies.

Schematic sequential research plan, represented in Figure 1, has two stages: qualitative research and quantitative research. Building on the findings of the exploratory analysis in the first stage, the stages of data gathering and qualitative data analysis were completed early on. then move on to the following stage using qualitative methods (survey of 35 respondents) to test or make generalisations based on preliminary findings and interpret the findings of qualitative research made with preliminary findings through (interviews with 74 science teachers). To determine the overall prevalence of a larger sample scheme, the instrument was created based on results at an early point. Analyses of both

quantitative and qualitative data were combined and triple-checked.

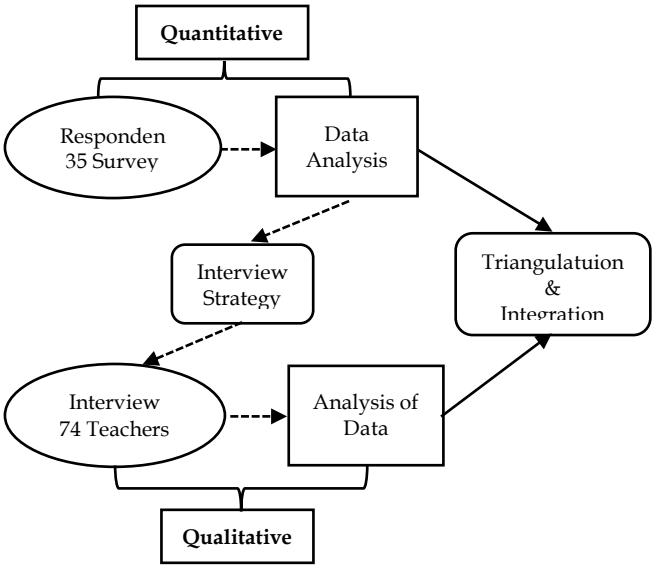

Figure 1. The Research Design Schematic

Result and Discussion

Based on the findings and analysis of the data collected from the distribution of surveys to science teachers, Table 1 presents the teachers' opinions of the effectiveness of the saccafolding learning programme with peer tutoring in enhancing HOTS and scientific communication skills.

Based on an analysis of the data in Table 1, it can be concluded that 98% of science teachers are committed to helping their students develop their full potential as learners by using teaching methods that are thought to be successful in helping students reach Minimum Completeness Criteria. The survey shows that 81% of teachers have not implemented learning steps that focus students on being active in class learning by providing scaffolding, even though 62% of teachers have facilitated students to work together/collaborate in solving learning problems/assignments. It's just that in group study activities 93% of teachers have not facilitated students by providing study tutors in each group to direct their study partners in understanding learning concepts, so that the implementation of learning that is oriented towards improving scientific communication skills and HOTS experiences difficulties. Learning strategies that are considered good/effective have not been able to lead students to achieve Minimum Completeness Criteria and there are still many students who take remedial. Following are the results of interviews conducted with science teachers presented in Table 2.

Table 1. Percentage interpretation of the questionnaire on science teachers' perceptions

Questions	Yes (%)	No (%)
Teachers facilitate students to achieve Minimum Completeness Criteria in science learning	98	2
The teacher applies the learning steps by explaining the material – group work – individual work – conclusion	19	81
Teachers provide opportunities for the class to work together in solving learning problems/tasks	62	38
Teachers apply group learning by providing rules in the division of their groups	23	77
In carrying out group learning, is there a rule by asking the smartest students to guide their group mates.	7	93
When teaching science, instructors also develop students' HOTS and scientific speaking abilities	34	66
Students can accomplish using learning techniques that are deemed to be good or effective Minimum Completeness Criteria	37	63
Examples of educational initiatives that can help pupils succeed are needed Minimum Completeness Criteria	100	0
Average	51	49

Table 2. Questions and Answers from the Teacher

Teacher's Questions	Responses
Do you in teaching science material really facilitate students to achieve Minimum Completeness Criteria?	Yes, by choosing a learning model/strategy and using the right LKS.
What teaching steps do you usually do in class?	I teach by explaining material and then asking questions. I also sometimes teach by explaining material - group work - presentation - conclusion.
Do you facilitate students to work together/ collaborate in solving learning problems/tasks?	Of course, I often facilitate students to work together (groups) to solve learning problems/assignments.
Do you apply group learning with rules in group division?	Yes, I apply group learning by dividing the number of students equally and heterogeneously in terms of gender.
Do you carry out group learning, are there any rules?	Yes, by giving each other ideas for solving problems.

Teacher's Questions	Responses
Do you ask the smartest students to be study tutors during group study activities?	No, I have never asked students to become study tutors during group study activities. So far, I haven't thought about having the smartest students become study tutors, maybe that could be a good idea to improve the quality of student learning.
Have you ever measured students' scientific communication skills and HOTS?	I have, but not intentionally, so HOTS and scientific communication abilities are not assessed.
How do you facilitate students to practice their scientific communication skills and HOTS?	My way of facilitating students to practice their scientific communication skills is through group discussion activities, then asking them to present the results of their discussions in front of the class I facilitate students to practice their HOTS skills by giving questions/exercises that demand their thinking skills.
Has the learning model/strategy you have used so far been able to lead students to achieve KKM?	Not yet, actually only a small number of students reach the KKM.
Do you need a scaffolding learning program with peer tutoring to improve students' scientific communication skills and HOTS?	Yes of course we do, we need examples of learning programs that can train students' scientific communication skills and HOTS.

It is believed that the use of learning activities with the guidance/assistance of the teacher and learning tutors gives teachers a positive perception for teaching science material that is abstract/difficult to understand by students. This belief is based on the presentation of the results of interviews that the teacher has conducted. According to the findings of the observations and interviews shown in Figure 2, the architecture of a peer tutoring programme with scaffolding is as follows.

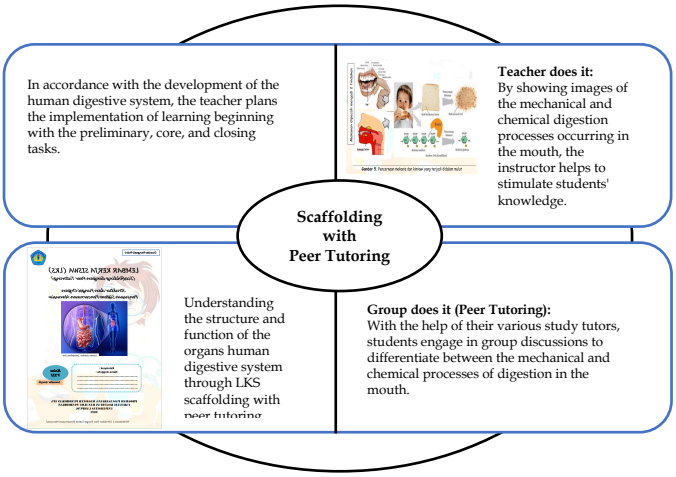

Figure 2. Scaffolding design with peer tutoring in learning programs

The step used in implementing scaffolding learning with peer tutoring is to develop a learning program. Learning programs designed in a structured manner based on student needs are expected to create a good learning climate. Teachers need learning scenarios that can improve scientific communication skills and HOTS. Therefore, serious attention is needed for teachers in providing assistance (scaffold) to students to solve learning problems. The application of scaffolding in learning activities offers many benefits to students through teacher assistance in supporting learning activities, including being able to facilitate students in building their scientific thinking skills, helping to understand learning concepts, and improving student learning performance. There is consensus on this (Acharya et al., 2022; Chen et al., 2023; Sarah, 2022) that the use of scaffolding in educational tasks improves students' comprehension of concepts that are thought to be challenging.The viewpoint backs up this (Buhaerah, 2022; Rezat et al., 2022) scaffolding can be used to support difficult types of materials, allowing for simple deconstruction and organisation of the item under discussion.

Of course, the teacher's help is essential, but so is the interaction between study partners. Through the tutoring interactions provided by group study partners, students will feel at ease working together to convey their ideas/ideas in solving learning problems. This is in line with some expert opinions that the role of peer tutors is able to facilitate students in learning activities through interaction between their study partners to explore and examine learning concepts through the guidance of their study partners. (Bailey et al., 2018; Winatha et al., 2022).

Learning that involves mentoring (scaffold) provided by teachers and learning tutors is able to provide positive feedback for teachers to facilitate students to be actively involved in learning activities, so that students can develop their potential competencies to train students in improving students' cognitive skills. Experts' opinions that students will be more capable and experienced in internalising new experiences through the guidance or support of others who are more experienced to be able to accomplish tasks beyond their

capabilities support this (Baur & Emden, 2021; Mojarrabi Tabrizi et al., 2019; Xi & Lantolf, 2021).

Based on this explanation, the use of scaffolding learning programs with peer tutoring makes it easier for students to understand learning concepts so that the actual knowledge possessed by students can develop to reach their potential knowledge to solve learning problems/assignments, as well as train students to develop their scientific communication skills. The complexity of the teacher's role in creating a good learning climate requires learning strategies according to student needs by providing guidance/assistance (scaffold) to students to be able to practice communication and thinking skills by developing problem solving, working with tutors and group teams, and following the stages of learning scaffolding with peer tutoring. As stated by (Cook et al., 2022; Garrison, 2022; Zain et al., 2022), appropriate strategies are required in order to foster an environment where students are encouraged to work on all issues at all times. Through assistance from teachers and study tutors in developing scientific justifications, conceptual understanding, and skills methodically, the application of scaffolding with peer tutoring in learning activities is anticipated to produce meaningful learning for students.

Conclusion

According to the poll findings, teachers have a favourable opinion of the scaffolding learning programme that combines peer tutoring with HOTS to enhance students' scientific communication skills. Based on the findings of a study on the application of scaffolding with peer tutoring in learning activities at school, some teachers have not used scaffolding learning programs with peer tutoring. The use of scaffolding learning programs with peer tutoring not only provides assistance to stimulate or develop their actual competencies to reach potential competencies but also trains students to explore communication skills based on scientific facts so that they can support curriculum 2013 learning. Science learning by applying scaffolding with peers tutoring has the potential to develop learning activities that are oriented towards equipping or improving students' scientific communication skills and HOTS, so as to be able to involve students directly to be active in the learning process.

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